DOCUMENT RESUME

ED 311 877 IR 013 996

AUTHOR Riel, Margaret M.
TITLE The Educational Potential of Computer Networking. Interactive Technology Laboratory Report #16.
INSTITUTION California Univ., San Diego, La Jolla. Center for Human Information Processing.
PUB DATE Aug 86
NOTE 36p.; Paper presented at the Annual Meeting of the American Educational Research Association (San Francisco, CA, April 16-20, 1986). For related documents, see IR 013 990-991, IR 013 995, and ED 303 155.
PUB TYPE Information Analyses (070) -- Viewpoints (120) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Computer Assisted Instruction; *Computer Networks; *Cooperative Learning; Educational Innovation; Foreign Countries; *Intercultural Communication; Language Skills; Microcomputers; Science Instruction; Second Language Instruction; Social Sciences; *Technology Transfer
IDENTIFIERS *Functional Learning Environments; *Intercultural Learning Network; Israel; Japan; United States

ABSTRACT

The educational potential of computer networks will be realized only when educators stop focusing on technical connections and start asking how educational activities that are supported on computer networks can make a significant contribution to education. Computer networks can contribute to accomplishing educational goals in language arts (by improving reading and writing skills); social science (by facilitating international and intercultural sharing of aspects of daily life, news stories, holiday customs, and social problems); science (by extending the range of observations for solving scientific problems); and foreign language learning (by using the Intercultural Learning Network as a functional learning environment, and increasing motivation for the study of foreign languages in the United States and for the improvement of English communication skills in foreign nations). Among the central issues that have evolved from the collaborative work of those using educational networks are that establishing technical connections between participants is only the first step. An active role for the classroom teacher in designing and implementing such activities is vital if networks are to reach their potential. (30 references) (GL)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

IR

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

✓ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Interactive Technology Laboratory

ED311877

Report No. 16

The Educational Potential of Computer Networking

Margaret M. Riel
University of California, San Diego

August 1986

IR013996

Center for Human Information Processing
University of California, San Diego
La Jolla, CA 92093

BEST COPY AVAILABLE

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Ronald Sommers
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Report No. 16

The Educational Potential of Computer Networking

Margaret M. Riel
University of California, San Diego

August 1986

Presented at AERA, San Francisco, April 16-20, 1986

The Educational Potential of Computer Networking

Margaret M. Riel
University of California, San Diego
August 1986

Abstract. The educational potential of computer networks will be realized when we stop focussing on the technical connections and start asking how educational activities that are supported on computer networks can make a significant contribution to education. My colleagues and I are exploring ways to use networking to help students learn to read and write, to explore their social and physical world, to understand and integrate new knowledge with existing knowledge, and to gain a better understanding of cultural and linguistic issues.

Many of the ideas in this paper reflect the collective work of the InterCultural Learning Network participants. I would like to acknowledge in particular the contributions of the site coordinators: Moshe Cohen (Jerusalem, Isreal), Jim Levin (Illinois, USA), Naomi Miyake (Tokyo, Japan), Gloria Fimbres and Marcia Boruta (Tijuana, Mexico) Dennis Sayers (Hartford, Connecticut /San Juan, Puerto Rico). The Apple Foundation and InterLearn provided the hardware and software support for this project. Special thanks to Hugh Mehan and Barbara Miller-Souviney for their comments.
Please send comments to M. Riel, ITL D-002, UCSD, La Jolla, CA 92093

"What is the educational value of computers?" was a question frequently asked when personal computers started appearing in schools. This question was part of the discussion about a "computer revolution" that would significantly change the way we think as well as the way we think about education. While that revolution has not yet materialized, there have been some significant changes over the last few years in the ways computers are being used in schools. While many educators began with the goal to make students "computer literate," they are now making the shift to integrating computers into the curriculum to accomplish educational goals.

Less then ten years after the introduction of microcomputers, we are hearing the same type of excited claims for the educational potential of computer networks. There are valuable lessons to learn about the use of computer networks from the history of computer use in school. Computer networks, like computers, need not become the focus of our learning. The power of this technology is in its use as tools to accomplish a wide range of educational goals. These lessons can direct the approach we take as we try to assess the educational value of computer networks in schools.

Computers and their Educational Value

Before 1980, when people talked about computers, they frequently were referring to large machines located in the basements of universities and businesses accessed at computer terminals by trained technicians. Beginning in the 1980s this

concept of computers changed. Computers had shrunk in size so that the most frequent referent of the term was a small stand alone "personal" machine. While these machines lacked the power of their larger sized cousins, their low cost and portability facilitated their rapid introduction into the society. In fact, many parents and computer programmers were asking questions about the educational potential of these machines before schools had even taken notice of them.

Educators, of course, cannot be blamed for their initial indifference to the developments in the computer industry. Schools were, and are, hard at work at the impossible task of preparing students for the complex and changing society that they will inherit. But as computers began to appear in other sectors of society, particularly in businesses and homes, educators came under pressure to provide students with at least minimal survival skills in the new technical world that visionaries were heralding.

These visions of the future information age rarely included pragmatic clues to schools about how to use of computers. The response of schools to the sudden availability of computers was to establish "Computer Literacy" as the goal of student learning (Luehrman, 1981; Seidel, Anderson & Hunter, 1982). Even this limited approach to computer use was made more difficult by the fact that no matter how computer literacy was described, very few of its teachers were computer literate themselves (Wright, Melmed, & Farris 1984).

COMPUTER AS THE OBJECT OF STUDY

In "Computer Literacy" classes (Seidel, Anderson & Hunter, 1982) students looked at computers from the inside out, learned the technical names for input and output devices, and how to program the computer to do simple tasks. This introduction to programming at the elementary and high school levels was so inadequate in scope, depth and choice of language that it provided no preparation for college work (Linn 1985).

The early appearance of computers in classrooms was further hampered by the dearth of good "educational" software. While teachers found that computerized flash cards and worksheets were motivationg, it was hard to justify the expense for these applications. This initial lack of teacher preparation and well designed educational programs lead to massive underutilization of micro- computers in classrooms (Becker, 1983).

COMPUTERS AS TOOLS TO ACCOMPLISH EDUCATIONAL GOALS

Educators, at first stunned by the appearance of computers, soon regained control and began calling for the integration of computers into the curriculum of the school (Sheingold, Kane & Endreweit, 1983; Cohen, Levin & Souviney 1986). In the short span of approximately five years, computers were transformed from objects of study to powerful educational tools (Levin & Souviney 1983; Olds, 1985). Computers were no longer set apart as things to <u>learn about</u>, but were instead being actively explored as instruments to help

achieve previously established educational goals and pursue new educational goals (Clements 1985; Chandler 1984; Mehan, et al. 1986).

Computer literacy and programming courses are rapidly being replaced by word processing, problem solving, and other computer application courses (Souviney & Miller- Souviney 1986; Lancy 1986, Lockheed and Mandinach 1986). The focus has shifted from computers per se, to what computers can do.

Computer Networks and their Educational Value

Now computers are talking to each other. Computer networks make coordinated activity across vast reaches of time and space possible. For example, computer networks help ticket agents anywhere in the world find out how many unassigned seats are available on an airplane, or help stock brokers find the current information on the stock exchange. The news of events in our society travels around the world almost instantaneously through major computer networks. Throughout our society information is becoming stored on large computers making it possible to carry on more and more of our normal transactions by romote access. We get our money from automated tellers. Our major purchases, as well as most of our food, is priced and inventoried with the aid of computer networks. Locating information about services and ideas is often accomplished by assessing computer networks.

While we have participated in these uses of networks, they

have not been of our making. These computer networks are like the large computers that preceded the personal computers, technology that is distant and controlled by others. The "personal" computer brings with it the potential to have these computers "communicate" with one another as well as interact with larger computerized networks. It is becoming increasingly easier to "send" information created on one computer through telephone lines or by satellites to the screens of other computers to be read, modified and printed by others. These rapid developments in telecommunication have raised the question of the educational potential of computer networks and their place in schools.

COMPUTER NETWORKS AS OBJECTS OF STUDY

Computer networks are travelling down a path that is similar to that which computers traveled a decade ago. Talk about the "educational potential" of networks is becoming common and educators are equipping labs with modems, telephone lines and networking software so that they can involve their students in this new educational activity.

Just as computers were made the object of study when they were first introduced in schools, computer networks are currently being made the object of study. Teachers and students share the excitement of learning about networks as they send their first message across town or to further places. The sending and receiving of messages is the focus of the activity while the content of the exchange is often ignored.

These experiments with computer networks seemed to have assumed that once in contact, teachers and students will have meaningful and informative exchanges. Our experience as well as that of many other projects (Levin, Riel, Boruta and Rowe 1985; Levin and Riel 1985; Newman, 1985; Levin, 1985) indicates that meaningful exchanges do not automatically follow after contact has been established. After a few excited messages about what can be shared, the new channels of communication most often fall into disuse.

Like computer literacy courses, this approach to computer networking is shortsighted. It inappropriately places the emphasis on the technology by making it the object of study. It does not focus on the development of educational activity that computer networks can support.

Computer Networks as Tools to Accomplish Educational Goals

If computer networks are to be utilized in the schools, they will do it by becoming a means to accomplish educational goals and not by remaining an end in themselves. The educational potential of computer networks will only be realized when we stop focussing on the technical connections and start asking how educational activities that are supported on computer networks can make a significant contribution to education. The question is not how can computer networks can be made a part of the school curriculum, but how can the educational goals of teachers be realized through the

use of computer networking, that is, how computer networks help students learn to read and write, to explore their social and physical world, to understand and integrate new knowledge with existing knowledge.

My colleagues and I have begun with these questions and are exploring ways to accomplish these educational goals that involve the use of computers and computer networks. This paper explores the use of computer networks to accomplish educational goals in four areas (1) language arts, (2) social science, (3) science and (4) foreign language.

Reading and Writing Skills and Computer Networks

How can students who do not write in the classroom, or have poor writing skills, be enticed to develop these skills? How could computers or computer networks help us achieve this goal? The "Mental Gym" program for learning disabled students in an elementary school was an experiment to answer this and other questions (Riel 1985).

In the Mental Gym we asked how can a motivationg environment for students to learn to read and write be created. One important ingredient in creating such an environment was the goals of students. What would motivate them to write? Students are most often asked to write without a concern for either purpose or audience. So the first task was to find a writing context that students saw as meaningful. However, focussing only on the

interests or goals of the learner results in a romantization of students' ability to direct their own course of study (Kolberg and Mayer, 1972).

Writing to people in distant locations is something that students have been doing outside of school for a long time. Could the computer and computer networks use this activity within the classroom to create a motivation environment for students to read and write? We used computers to establish a "computer-pal" network between students in California and Alaska (Levin, Boruta, Riel and Rowe 1985). Writing to computer pals was motivationg to the students at first and it did encourage writing. The computer pals idea was limited, however, as it neither encouraged different forms of writing nor provided a context for careful editing and revision of students' written text. The reading of other students' writing was minimized by this one-to-one form of communication and if students did not receive a letter with their name in the salutation, they were not interested in reading the content. But perhaps most important, this project assumes that all students lacked was an audience to whom to write. We found that students need a purpose in writing as well.

Teachers and researchers searched for a writing environment that would overcome some of these limitations. The computer-pals network was transformed to the Computer Chronicles Newswire service. The newswire made the communication between students more public, extended the audience for student writing, increased

both the range of types of writing and created a situation in which editing and revision were natural parts of the activities. Writing for a distant newspaper provided both audience and purpose for writing.

This use of computer networks was very effective in improving the quality and length of students writing in computer lab programs for students with learning handicapps, the Mental Gym program, and in regular classrooms (Riel 1985a; Riel 1985b). When fourth grade students edited their own and other students' writing, their scores on the language mechanics portion of the Comprehensive Test of Basic Skills doubled the expected gain. By creating an environment in which students wrote for the purpose of communicating with a particular audience (rather than solely for the evaluation by their teacher) and a purpose for writing, we find that students paid more attention to the informational content and clarity of their writing (Cohen & Riel 1986).

The Intercultural Learning Network extended the Computer Chronicles idea of writing for an audience to an international scale. Our pilot work showed that writing for an audience which has different cultural traditions and ways of thinking requires students to pay even greater attention to content and clarity in order to avoid misunderstandings (Cohen, Levin and Riel, 1985). We also found that students responding to "requests for more information" generated from other sites, were often motivated to seek out accurate information from encyclopedias, local experts, and other

resources in order to expand their own knowledge in the content area in which they were writing (Cohen and Miyake 1985).

As part of the research on the InterCultural Learning Network, we contrasted the quality of Israeli high school students writing to their peers on the network and to their teacher for a term grade. Both teachers and reviewers found that the quality of students work was better when writing to peers on the network than when writing for their term grade (Cohen and Riel 1986). We are continuing to find similar gains in writing skills for students in other sites participating on the network.

Social Science and Computer Networking

These finding indicate that networks can be used to help students develop writing skills. In addition to improving writing skills, we have been exploring the use of networks to promote cooperative learning across linguistic and cultural boundaries Groups of secondary and university students from Tokyo, Japan; Jerusalem, Israel; Mexico City and Tijuana, Mexico; San Juan, Puerto Rico; St Croix, The Virgin Islands, and Juneau, Alaska; Maui, Hawaii; Hartford, Connecticut; San Diego, California, and Champaign, Illinois in the U. S. were engaged in a number of cooperative social science and problem-solving projects. The InterCultural Learning network is an activity-centered form of exchange which helps students to investigate issues of mutual interest across cultural and linguistic boundaries.

SOCIAL SCIENCE ACTIVITIES ON THE NETWORK

Cultural Packets. Students began their participation on the network with an in-classroom discussion about what culture is and what they think that others should know about their culture. They prepared cultural packets representing this information using pictures, photographs, cards, text, coins, guides, maps, newspapers etc. These packages were sent to each of the sites. This exchange of cultural artifacts gave students some sense of what is common and what is different in each of the sites. For example, the students in Tokyo and California were surprised to find that they each had an almost identical "Disneyland." The inclusion of the railroad schedule in the Japanese cultural packet raised questions about the common means of transportation in different sites. The exchange of cultural packets helped students begin to think about the concept of culture. These packets form the initial information to focus intercultural exchanges and often became the starting point of student- initiated projects.

Computer Chronicles International Newswire. Students writing for the international newswire provides the context for the sharing of many important aspects of their daily life. Here is an example of one Israeli student's contribution to the newswire.

From: BBW928 (JERUSALEM) 24-Lines
On:23 FEB 1986 At: 11:14 Copy: BC
Subject: JE 23FE CCN Article for the Computer Chronicles Newswire

Hello! My name is (Name). I'm living in Jerusalem and I'm 15 1/2 years old. I want to tell you about the "National Service" that I have done: [12]

I (me and my class) arrived to a military base. There we had the first connection with the army. We lived there in tents for a week, the army gave us work-uniforms. We lived there in some military discipline. I worked there in an ammunition dump I'd categorizating bullets, and I worked also in a quartermastership for categorizating blankets. Most of time we play and rest.

One day, in the middle of the week they took us for a tour around the base, we saw there helicopters doing aerobatics and old airplanes in a small museum of the base. We go up to a control tower, from there we saw almost the whole air field. We saw a film about the process of pilot selection and training. It is very difficult! All the time we were in canteens and sometimes I phoned home. The night was very cold: I covered myself with a sleeping bag and 3 blankets. and I shivered from cold! After the taps we told each other jokes and some of my friends were singing We're got up very early in the morning. It was so early that even the sun didn't rise yet and outside was very cold! Some of my friends were working in a regular amunition dump and worked with rockets and shells, and others went to work in a small "zoo--farm" which was built for the children and families of the pilots.

That's all for this time, I hope to recieve from you a letter, good-bye.

(Name)

Holidays as Cultural Windows. Holidays or "cultural celebrations" are markers of the social, political and religious values of a culture. Sharing information about what type of days are marked as holidays and examining their historical and cultural significance has provided students with windows into important cultural similarities and differences. In this project, students have

listed and compared holidays celebrated in their culture with those of other cultures. They are currently developing a category system to help them compare different types of holidays. As holidays are celebrated, students describe the history, the cultural practices associated with the holiday.

The following description of a holiday by the students in Mexico indicates the type of information that is exchanged.

From STK148 (MEXICO)
On:16 MAR 1986 at: 04:14 Copy: BC

Subject: TM 16MA CULT March holidays

* EL DIA 18 DE MARZO ES UN DIA CIVICO QUE SE ENCUENTRA EN ELCALENDARIO ESCOLAR, PERO ESTE DIA NO HAY SUSPENSION DE CLASES.

18 DE MARZO
(EXPROPIACION PETROLERA)

*No se suspenden clases.
COMENTARIO:

Este dia lo celebramos en los planteles escolares con una asamblea en honor al Presidente Lazaro Cardenas quien promulgo la Expropiacion Petrolera el 18 de marzo de l938. (Lazaro Cardenas murio en l970).

El Presidente de nuestro Pais le rinde honores ante su tumba llevan- dole arreglos florales y dice un discurso recordando a un gran hombre como lo fue Lazaro Cardenas.

Para nosotros los mexicanos es un dia muy especial pues fue cuando Mexico se vio libre de las Empresas Extranjeras (tanto Norteamericanas como Angloholandesas).

El Presidente hizo un llamado a todos los mexicanos para que contribuyeran al Fondo Nacional (Cooperacion con capital de cada uno) para pagar lo que se debia a las Empresas Extranjeras.

La respuesta a ese llamado fue correspondida favorablemente logrando reunir todo el Capital que hacia falta para pagar la deuda a las Em-presas Extranjeras.

Desde un punto social y politico general, esta tendencia espontanea hacia la mexicanizacion de la Industria Petrolera coincidio con un clima de cambios avanzados que transformo al Pais considerablemente y culmino en un gobierno progresista, solidarizado con las fuerzas democraticas.

****

(STUDENT NAMES)

Preparing this information helps students reflect on their own culture. Comparing holidays with others gives them a pespective on what types of holidays are likely to be common to more than one cultural group and which type of holidays are unique. Tracing the history of holidays shows patterns of influence from other cultures.

Newspaper Analysis. Students have compared international news stories carried in their local newspapers. In one project each site compared monitored the international news for a one week period exchanging headlines and length of articles. Here is a message about the comparison:

From: (Name) U C San Diego
To: News Comparison Group
May 30, 1985

I have been reviewing the newspaper headlines from the various sites, and I did not find many articles that were common. The recent journey by president Reagan to Europe,

and the recent tour of the Benelux countries by the Pope, were probable the most common news articles that were found in each of the newspapers. The recent disaster at the Bradford Football Field was also found in most of the newspapers, but not all, for example the Mexican newspaper did not even mention the fire at Bradford.

I have compiled a list of similar news....

Other projects have focussed on international events and examined how they were presented in newspapers in each of the sites. For example the students compared stories about the end of World War II for a one week period around the 40th anniversary of the end of the war and the United Nations Decade for Women for a one week period around the World Conference marking the end of the Decade.

These projects helped students discover that there are relatively few "international" events that appear in all newspapers in the same way at the same time. Also the frequency of news from different foreign countries is very different in each of the sites. This information leads students to understand that news coverage in newspapers provides a selective view of things that happen in the world.

Student Initiated Projects. The projects described to this point were introduced by teachers and researchers. They helped students reflect on thier own culture and provided the initial context for exchange. The goal, however is to encourage students to develop their own ideas for projects on the network. Information

exchanged in the initial cultural explorations has become the basis for student-initiated cooperative research projects. For example, if the students find that they all share a similar holiday, a small group of students representing each of the sites might explore the history of this holiday in each site. Or, a newspaper story or item in the cultural packet might become the basis of a cooperative project.

An example of a student-initiated project on the network is the discussion of strategies to solve a social problem that was described by the students in Tokyo. The Japanese student introduced the topic of "Ijime" in an initial article for the Computer Chronicles Newswire. Ijime was described as a a Japanese social problem in which teenagers mental and sometimes physically exclude or bully a student until the student commits suicide. This is the first message that was sent to the Computer Chronicles Newswire:

> From BCF302 (TOKYO) 9-line
> On:11 NOV a985 At: 09:01 Copy: BC
>
> Subject: TO 11NO CCN Computer Chronicle article from Tokyo
>
> A problem at Japanese school ---"Ijime"
>
> Now we have a problem that children - elementary school and junior high school students - commit suicide. And one of the some causes is "Ijime" in school. "Ijime" means that many students ignore a specific student, give him a mental blow and injure him by violence. The cause is not clear. Students who are too weak to retaliate become targets. They can't tell that to teacher and their parents. And they are worried about by themselves, For that they kill by themselves.
>
> This was followed by many questions from all sites as

participants tried to understand the problem and suggest ways of handling it. These messages included discussion of telephone "hotlines," friendship patterns and school counselors. There was a small survey carried out in Japan to help indicate the scale of the problem.

The following message was sent from Tokyo four months later. The beginning of this message was a response to a message sent by by a student in California who suggested a crisis phone line. The second part of the message was a response to questions for more information about how Ijime happens in schools. The final part of the message is a request for information for students about another possible solution, a counselor system.

From: BCF302 (TOKYO)65-Lines
On:03 MAR 1986 At: 09:43 Copy: BC

Subject: TO 3MA CCN : IJIME

Dear (Student Name)

When I read your message, I want to ask you about The Red Line.

1: What a kind of children call it?
2: What do they tell?
3: How old are they?
4: How many telephones do The Red Line have?
5: Is there many telephones in all direction?

Please show us and put into concrete shape!!
From The Investigation Team of Ijime. (names)

To (Name)

This time, we send the example that is easy to understand and

whose situation is clear comparatively. This is the story of a boy who killed himself because of Ijime the other day.

==========

A 8TH GRADE BOY COMMITTED SUICIDE, IN HIS FATHER'S HOMETOWN.

It was found that Hirofumi:Shikagawa (13 years old, 8th grade in Nakano Fuzimi Junior High School) who lived in Tokyo was found dead by hanging himself in a public lavatory at Station Department store in Morioka at 10:00 p.m. in February 1. As his suicide note that was listed his classmates' name was written on the paper bag in his bag, The Metropolitan Politan Board judges it is a suicide because of Ijime.

< HIS SUICIDE NOTE >

To my family and my classmate

I'm sorry to disappear suddenly. I think you can understand the detail about this cause by asking Mr. OO or Mr. XX (his classmates). I don't want to die yet. But if this situation does not change, it will be "a hell on earth." It would be meaningless that another classmate become a scapegoat instead of me after my death. You should not be so stupid. It is my final desire.

1986, Feb. 1Hirofumi Shikagawa

Mr. Shikagawa became a subject of Ijime. The earlydays, he was forced by some classmates to run errands and to bring their bags when they go to and come from school. But the content of Ijime escalated gradually. For example, one day his classmates drew a mustache on his face, and ordered him to dance in the hall. And another day he was ordered to climb a tree and sing a song. At that time he belonged to a 7 or 8 8th graders' group, in which he was forced to run errands. He wanted and tried to leave the group. Since then Ijime by this group was escalated. He came to be absent from school more often. When he went to school, perhaps because he was afraid of Ijime, he very often hid himself in the lavatory for teachers or in the school health center.

==========

I hear there is a school counsellor system in America. In Japan, many students who are bullied can't consult with their teachers and parents. Because if students appeal to, they'll be bullied again. So, I don't know if a school counsellor system serve as the means of solving its problem. In America, what problem do they consult? Are their problem solved by consulting?

From (Names)

The attempt of people on the network to help the students in Tokyo explore this important social problem has led to some very insightful discussions about aspects of each other's culture. The type of solution offered (talk to parents, teachers, friends, counselors or crisis phone operators) or the explanations of why an approach would not be productive involves students in the analysis of aspects of the problem and its integral relationship with culture. It has also led to some thoughtful exchanges on the meaning of friendship and peer relations during the high school years.

Science and Networking Activity

Networks can also be used to extend the range of scientific observations about what can be collected about physical events (Levin and Cohen 1985). There are many factors in the environment that change such as temperature, soil and air composition, pollution, atronomical observations. Students could measure, record and compare their measurements to achieve a deeper understanding of factors that influence the variance.

For example a group of students on the Intercultural Network participated in the Halley's Watch project. While waiting for the time to share observations of the comet, they have been sharing observations of the sky and have been able to test assumptions about what the moon or stars should look like to participants in other parts of the world.

From: BCF302 (TOKYO)76-Lines
On:24 NOV 1985 At: 02:32 Copy: BC

Subject: TO23NO-HC : OBSERVATION PROPOSAL

Dear Halley's Comet fans:

This is a set of proposals for possible activities Takito and Naomi wish to have your collaboration. From Japan, Takito's elementary class of some 20 students at Toyama will participate, with some college students' help. Let us know if you would be participating in any of these; let us also know if you do not wish to keep receiving messages relating to this topic. Thank you.

Naomi (TO)

*****

Let's exchange observations. When observing by eyes, Totsuka suggests to use a B5 sheet (a bit smaller than your standard letter size), with 15 cm X 20 cm window for sketch of the background (at the bottom one-third) with background stars.

Below the sketch, he proposes to record:

a. date, time (to minutes), place
b. weather, temperature
c. direction, clearness of the sky
d. detailed sketch of the coma and the tail
e. conspicuous background stars, five to six,
   preserving their relative positions as correctly as possible
f. at the bottom, draw the sketch of the background landscape...

An example of a problem solving science activity students have undertaken on the InterCultural Network is understanding where water comes from and how its storage and conservation is accomplished in their community (Levin, Riel, Miyake & Cohen, 1986). Each site explored their local solution to the problem of water supply to residents. The sharing of this information gave students a much richer understanding of the multiple ways of solving the water supply problem. Students reviewed solutions of water supply problems at other sites and evaluated the utility of the procedure for their own site. Understanding why a procedure would or would not be useful gives students a richer understanding of the process of evaluating alternative solutions in problem solving tasks.

> From: STK148 (San Diego)
> On: 2 FEB 1986 At: 12:08 Copy: BC
>
> Subject: Report from Lincoln Middle school on Water Project
>
> The water conservation project is underway. I introduced the project goals (problem solving and looking at ways people get water) to the science students. I also went over the InterCultural Learning Network sites with them and gave them a pre-test on water usage and conservation, taken from a kit which a local water district supplied....

and this is from a report of activities in the third week:

> Next week we will look at how the early gold miners decided water rights, the meaning of some news terms and then conduct an experiment to find out which of three types of soil (sand clay or dirt) holds water best....

The students exchanged messages about what they had learned and asked students at other sites if they used the same or different

methods to purify and conserve water.

In these types of activities students can learn to conduct scientific observations and use a network to share them with others in much the way adult scientists do.

Foreign Language Learning and Computer Networks

In order to provide an equal opportunity for students in the various locations to participate in network activities, we strive to have the students work in their native language and work on the principle of "receiver end translation." We strive to use bilingual students to help other students understand messages that are in a language that they do not understand.

The following paragraph was taken from a message that Robert Rowe, a teacher from the San Diego site, sent on the network describing his students' participation in the Computer Chronicles Newswire. It indicates that this approach has been successful in his classroom.

> ...The network is succeeding in capitalizing on strengths and developing a sense of pride.
>
> I have a group of five or six students who are of Hispanic origins. While they tend to be very hard workers and extremely cooperative, a number of them struggle with their reading and writing. The articles we received from Mexico were particularly exciting. Since no one else in the class could read them the roles were changed. The articles written in Spanish illustrated to my top readers how hard it must be for the Hispanic students to read in English, and it allowed them to be in the spot light as top notch readers. These students who have been labeled as low or poor readers, all of a sudden

became the BEST readers in the class It was a really nice experience for everybody....

He reported that the students recognition of the bilingual students' ability to read had a lasting positive influence on the interactions of his students.

We have just begun to explore the Intercultural Learning Network as a functional learning environment for the study of foreign languages in the United States. Students in Japan, however, have been using the Intercultural Learning Network as a means to improve their communication skills in English. Preliminary reports (Cohen & Miyake, 1985) indicate that the InterCultural Network provides a motivation environment for using a foreign language. Computer networking activity can easily be integrated with the foreign language classes at both the secondary and university level.

The following message was sent by UCSD students who are learning Japanese and discovered that they could use the network to communicate with students in Japan. Their goal is to try to use their newly acquired language skill to communicate ideas and learn more about the culture as they learn practice using Japanese.

From: STK148 (San Diego)
On: 15 MAR 1986 At: 07:15 Copy BC

Subject: Message in Japanese to students in Tokyo

Imaizumi-san to Handa-san,
Konnichi wa!

Anata no tegami wo arigatou gozaimashita! Kyou wa sangatsu futsuka desu. Ima otenki wa sukoshi kumotte imasu. Haru

yasumi wa sanshuukan shite kimasu. Kon yasumi wa isshuukan dake desu. Mada umi ga samui desu kara, takusan gakusei wa sabaku e ikimasu. Yama ni takusan yuki ga areba gakusei wa skii ni ikimasu. Gakusei no naka niwa Colorado River e itte suijou skii wo shimasu. Dochira mo minna wa haru yasumi wo tanoshimi ni matte imasu.

Watashitachi wa kyonen no natsu Nihon e ikimashita. Nihon wa America to chigaimasu nee. Tatoeba Nihon wa takusan densha ga arimasu ga, America niwa amari arimasen. America dewa minna jidousha wo unten shite imasu. Dakara California wa takusan "smog" ga ima arimasu. America no wakai hito wa youfuku ni kanji wo kaku no ga ninki ga arimasu. Keredomo, Nihon e itta toki watashitachi wa shatsu ni eigo no kotoba wo kaite iru wakai ni Nihonjin ouzei mimashita. Okashii desu nee!

Donna ongaku ga suki desuka? Keredomo taitei no America no wakai hito wa "rock and roll" ga ichiban suki desu, watashitachi wa "jazz" ga suki desu. San Diego dewa ookuno hito ga "jazz" wo kikihajimete iru rashii desu.

Fuyu yasumi wo tanoshinde kudasai!
Sayounara
Mata ne

(Names)

This exchange of messages in Japanese was important as it made it possible for the students in Tokyo who were having trouble expressing their ideas in English to become the experts while students in San Diego tried to express themselves in Japanese. While not all people on the network can read all the languages, they often learn about the language by looking at what words reappear and trying to guess the meaning from the few words that they recognized.

Conclusion: Educational Activity as focus of

The theme that runs through all these examples is that educational networks can and have been used in classrooms to help students and teachers achieve important educational goals. Educators need to look past the current excitement of networking and ask the more serious question of how networks can enhance students' learning.

The terms "computers" and "computer networks" refer to the hardware that makes possible many exciting educational experiences, but they are not themselves the educational activity. We learn as much about the educational value of computers or computer networks when we make them the object of study as we do about the educational value of films by learning about how a movie projector works. Like other educational mediums, the way computers and networks are used will be the crucial factor.

There are a number of central issues that have evolved from the collaborative work of those involved in taking advantage of the potential of educational networks:

1) Networking activity, not network connections, should be the driving force in the creation of educational computer networks. Establishing the technical connections between participants is only the first step. Once the technical problems have been solved, the life of the network will be determined by the quality of the networking activities and the

interest they hold for the participants. A number of networking activities were described in this paper as examples. Most networks that simply open a new channel of computer communication are not successful (Levin & Riel 1985) . Computer networks are new tools, and like many tools they need to be created to accomplish a specific goal. Tools are created in response to a need. Seldom, is ever, have people make a tool and then looked around to find a use for it.

2) The role of classroom teachers in the development and facilitation of networking activities is vital. Teachers do not need to take on the role of computer technician. Their contribution to a network is most useful when they are able to take an active role in designing and implementing the educational activity on the network and in the classroom. Teachers and students can learn together how the computer serves as a different vehicle for human interaction, and find ways to blend the educational goals that the teacher holds with the intellectual interests of the students. Teachers, far from being replaced by computer technology, can take an active role in designing educational experiences that take advantage of the potential of networks to better educate their students.

3) Teacher and students need a system of message transmission, storage and retrieval that is efficient. The developmental state of current computer networks does not easily lend itself to offline storage and efficient retrieval of information.

At present, and maybe always, there needs to be a network librarian, someone who monitors the flow of information and distributes the mail to the appropriate groups or individuals. Often messages generated on a network will be of use to other groups that the sender was not aware of when directing the message. Multiple uses of information is made possible when messages are stored in a way that enables access. It might be possible to involve the school librarian in the sending, receiving and coding of messages. Since the library is where information resources are stored, it would be an ideal location for computer generated information. It is also possible that older students could do a large part of the sending and receiving of messages as teleapprentices (Levin, Riel, Miyake & Cohen 1986).

4) There needs to be technical support systems for sites on an electronic network. At the present state of the technology, and the lack of compatibility of systems, the potential of technical problems can be critical. Teachers need resources at the minimum to keep their system operating. But more than this, the state of computers and networks is in a constant state of flux. Schools are often the last to know about new tools that can streamline activities in the classroom. A computer resource center like the TEC Centers in California can help teachers locate the most appropriate teaching tools for their purposes.

5) Communication across cultural and linguist boundaries is facilitated by the "non-real" time operation

of computer networking. The immediate pressure to communicate that exists in simultaneous exchanges increases the possibility of linguistic and cultural misunderstandings. One of the positive aspects of non-real time interaction is that students able to receive messages, discuss the content and plan the response. This time between turns of text within a group discussion can provide relunctant participants and those working across languages and cultures the time needed to formulate their response (Quinn, Levin, Mehan & Black 1983). Linguistic and cultural resources can be used to help understand the content of the message and the most appropriate response. These resources may be found within the classroom, or they may come from nearby university or community organizations.

6) Participants need to know how long it will take for their message to reach its audience and when it is reasonable to anticipate a response. While computers can send messages instantaneously, a message is only "received" when the intended audience reads the message. The length of time it takes for a message to be read will depend on issues of access to the technology and resources for transmission and reception of messages. Activities played on the network will have to be sensitive to the exchange time of the participants on the system.

As educational networks find their way into the school, we hope that educators can avoid the error of making networking the focus of educational efforts and instead think creatively about the

type of networking activity that they want to develop. Beginning with knowledge and skills to be taught, the challenge will be to find ways to create exciting environments that help students and teachers work cooperatively to acquire new knowledge. In all the projects listed, the ideas for their development were created on the network through interaction of educators at schools and universities as well as students and researchers. And with both our successful and unsuccessful projects, we are just beginning to explore the educational potential of the network.

References

Becker, H. (1983). School Uses of Microcomputers (Issues 1 & 2). Baltimore,MD: The Johns Hopkins University, Center for the Organization of Schools.

Chandler, D. (1984). Young Learners and the Microcomputer. Milton Keyes: Open University Press.

Clements, D. (1985). Computers in Early and Primary Education. Englewood Cliffs, N. J.: Prentice Hall.

Cohen, M., Levin, J.A., & Riel, M.M. (1985). The World as Functional Learning Environment: An InterCultural Learning Network (Tech Rep. #7). Interactive Technology Laboratory, University of California, San Diego.

Cohen, M., Levin, J.A., & Souviney, R. (1986). Exemplary Educational Computer Use: Coping with Rapid Changes in Technology (Tech Rep. #12). Interactive Technology Laboratory, University of California, San Diego.

Cohen, M., & Miyake, N. (in press). A Worldwide Intercultural Network: Exploring Electronic Messaging for Instruction. Instructional Sciences.

Cohen, M., & Riel, M.M. (1986). Computer Networks: Creating Real

Audiences for Students' Writing (Tech Report #15). Interactive Technology Laboratory, University of California, San Diego.

Cooper, C., & Odel, L (1978). (Eds.). Research on Composing: Point of Departure. Urbana, Illinois: National Council of Teachers of English.

Kohlberg, L., & Mayer, R. (1972). Development as the aim of education. Harvard Educational Review, 42, 449-496.

Laboratory of Comparative Human Cognition (1982). A model system for the study of learning disabilities. The Quarterly Newsletter of the Laboratory of Comparative Human Cognition, 4(3), 39-65.

Lancy, D. (1986). The message is the medium: studies of computer applications in schools. Paper presented at AERA, San Francisco, April 15-20.

Levin, J. (1985). Computers as media for communication: Learning and development in a whole earth context. Paper presented at the Fifteenth Annual Symposium of Jean Piaget Society, Philadelphia, PA., June 8.

Levin, J.A., & Cohen, M. (1985). The world as an international science laboratory: Electronic networks for science education and problem solving. Journal of Computer in Mathematics and Science Education, 4, 33-35.

Levin, J. A., Riel, M. M., Rowe, R. D., & Boruta, M. (1985). Muktuk meets jacuzzi: Computer networks and elementary writers. In S. W. Freedman (Ed.), The Acquisition of Written Language: Revision and Response. (pp. 160-171). Hillsdale, NJ: Ablex.

Levin, J. A., & Riel, M. M. (1985). Educational electronic networks: How they work (and don't work). Paper presented at the Annual Meetings of The American Educational Research Association. Chicago, March 31-April 5.

Levin, J. A., Riel, M.M., Miyake, N., & Cohen, M. (in press), Education on the electronic frontier: Teleapprentices in globally distributed educational contexts. Comptempory Educational Psychology.

Levin, J.A., & Souviney, R. (1983). Computer Literacy: A time for tools. The Quarterly Newsletter of the Laboratory of Comparative Cognition, 5, 45-46.

Linn, M.C. (1985). The cognitive consequences of progamming instruction in classrooms. Educational Researcher, 14(5), 25-29.

Lockheed, M. E. & Mandinach, E. B. (1986). Trends in educational computing: Decreasing interest and changing focus of education. Educational Researcher, 15, 21-26.

Luehrman, A. (1981). Computer literacy - What should it be? Mathematics Teacher, 74, 682-686.

Mehan, H., Miller-Souviney, B., Riel, M., Souviney, R., Whooley, K., & Liner, B. (1985). The Write Help. Glencoe, Ill: Scott Foresman & Co.

Mehan, H., Miller-Souviney, B., & Riel, M. M. (1985). Knowledge of text editing and the control of literacy skills. Language Arts, 61, 510-16.

Mehan, H., Moll, L., & Riel, M. M. (1985). Computers in classrooms: A quasi-experiment in guided change (Final Rep. to NIE). La Jolla, CA: Teacher Education Program.

Newman, D. (1984). Functional Learning Environments (Tech. Rep. No. 25). New York: Bank Street College of Education, Center for Children and Technology.

Olds, H. (1985). The microcomputer and the hidden curriculum. Computers in Classrooms, 2, 3-14.

Quinn, C. N., Mehan, H., Levin, J. A., & Black, S. D. (1983). Real education in non-real time: The use of electronic message system for education. Instructional Science, 11, 313-327.

Riel, M. M. (1985a). The Computer Chronicles Newswire: A functional Learning environment for acquiring literacy skills. Journal of Educational Computing Research, 1(3), 317-337.

Riel, M.M. (1985b). Functional learning environments for writing.

In Computers in Classrooms: A Quasi-Experiment in Guided Change (pp. 135-200). Final Report to National Instutite of Education.

Seidel, R., J., Anderson R. E., & Hunter, B., (1982). (Eds.). Computer Literacy. New York: Academic Press.